

little chilling for these standard cultivars and in these areas it is best to use one of the following alternatives:

'Bruno' — this is a New Zealand cultivar with somewhat smaller fruit of a long narrow shape. The vine is quite prolific.

'Vincent' — This cultivar is from a seedling of Fred Vincent, propagator in balmy Yorba Linda. The abundant fruit, somewhat smaller than 'Hayward,' has been very acceptable to Mr. Vincent's local customers.

Two male cultivars are in common use in California. They are 'Chico Male' and 'Matua.' While there has been some complaint about their blossoming periods, both seem to be more than satisfactory under most commercial conditions in California.

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## MINIATURE ROSE PRODUCTION

RALPH S. MOORE

*Sequoia Nursery Co.,  
2519 East Noble Avenue  
Visalia, California 93277*

The propagation and sale of miniature rose plants has been our business at Sequoia Nursery for many years. During these years many changes have taken place, as has happened throughout the nursery industry. First of all has been the phenomenal increase in popularity of the miniature rose.

Beginning with miniatures in a small way, as a side line to our general nursery some forty years ago, we changed to the production of miniatures exclusively about 23 years ago. Since then our production has increased to the point where we now grow some 600,000 to 700,000 plants annually.

All of this production is from cuttings. We grow around a hundred different cultivars in all colors. In addition we produce around 10,000 miniature tree roses. For the trees we use an understock of our own, developed at the nursery. I will discuss the tree rose production in detail later.

But before we get into the propagation of miniatures as such, I wish to state that I am very much of the opinion that successful and economic production first of all stems from the breeding. Since all our production is by cuttings one of the first prerequisites is that a cultivar must lend itself to easy and efficient rooting. This is no happenstance so, from the beginning, my breeding efforts have been directed to the development of new and better cultivars of miniature roses into which I have bred this desirable quality. In addition, any new cultivar should be at least as good as other cultivars in the trade insofar as flower quality, color, plant growth and habit are concerned.

There is also the need for certain special purpose cultivars, for example: those suited to growing in warm climates or in cold areas. There is need for kinds which by their very nature, singles (5 petaled), ground cover, unusual, or novelty colors, climbers, etc. may not attain any great sales, yet can add considerably to the total production and sales.

Many of the European originations have in the past been, on the average, more difficult and slower to root. This I am sure was the result of either not giving this factor of easy rooting sufficient concern or that suitable cultivars for breeding this quality were not available to the European originators. Some of this lack is now being overcome partly because some of my own cultivars are now being used by overseas breeders.

Going back in time to my earlier years, I determined that certain species and cultivars had the easy rooting qualities I wanted. Among them the species, *Rosa wichuriana* (from which the famous ramblers were developed), *R. multiflora* in several forms and hybrids, certain of the older roses, especially some of the polyantha roses, some of the cultivars called "Sub Zero" roses developed by the late W.D. Brownell, and some of the "Kordes" cultivars bred by Wilhelm Kordes of Germany.

From such roses, plus several of my own hybrids as the basis for breeding, I have proceeded to make crosses in various combinations with the miniatures to develop the many cultivars we now grow. But without adequate planning it is easy to lose some of this ability for easy rooting and so new crosses are carefully planned to retain and to enhance ease of rooting.

Ease of rooting is an economic factor we cannot overlook, whether we are growing pyracanthas, geraniums, or roses. A quick rooting plant will usually take less time from sticking the



cutting to sale of the finished plant. With the increasing cost of heating, labor, etc., it only makes sense to get the plant on its way as fast as possible.

Important also is the development of the most desirable cultivar(s) as to shape and branching habit, one which shapes itself saves in shearing or pinching. Also, a naturally bushy miniature rose plant will produce more cuttings than one which tends to grow open and leggy.

If a mother (stock) plant of cultivar 'X' will produce 25 cuttings and another cultivar 'Y' will produce 50 cuttings in the same space and time, we can no longer grow 'X', and if the new cultivar 'Y' will root quicker with a higher percentage of plants it is easy to understand why I contend that one of the important factors of successful propagation and growing is first of all in the breeding.

And so we begin our propagation with the selection of cultivars to be grown. Of course, we all want to grow plants which can be sold in the market place, hopefully at a profit.

The kinds to be propagated must have sales appeal. They must have color and other qualities which the buyer wants. So first of all we must grow a saleable plant.

Desirable qualities which we must always keep in mind when making up any list to be grown are. ease of rooting, availability of cutting material, resistance to disease problems, general good looks of the plant, and cost of production. We can sum up our list of desires in two words (1) *Growability* and (2) *Saleability*. So we select the best cultivars to be grown. Now we must get down to the actual "dirt gardener" approach, and that is what I now want to share with you.

We have bred or developed our cultivars. Many of the better cultivars on the market today are protected by plant patents and it is unlawful to propagate them without permission (license) from the patent owner. So we select the kinds to be grown from our own patents or kinds for which we have license from others to propagate, plus certain of the older kinds and/or newer ones which for some reason were never patented.

We also must decide the colors or color balance we need to grow and in what quantities. Propagation of certain cultivars may be limited by quantity of cutting material available. But over a season's time this is often leveled out because we propagate all year.

To make this paper more specific, I will now attempt to go through a complete growing cycle. Cuttings are generally taken from plants growing in one or two-gallon plastic containers. We use these containers for several reasons:

- 1) It is a good size for growing and handling.
- 2) Plants can be moved from place to place easily; for example, we grow much of our cutting material in the plastic houses. Plants grow faster, thus producing more cuttings in a given time. But it is also desirable to move plants outside to rest and recuperate periodically. We can then use the space to better advantage for other cultivars as needed to produce the total desired quantities of cuttings.
- 3) As we add or discard cultivars it is much easier to do so if they are grown in pots.

Cuttings are generally made with two or three nodes, of rather soft to semi-hard wood. Leaves are left on. During the winter we often use hard or mature wood, mainly because we have it. Rooting of the harder (more dormant) wood is much slower. All cuttings are rooted outdoors in the warmer parts of the year (April through September). The leafy soft to semi-hard cuttings will root in 3 to 4 weeks; often in warm summer weather rooting will occur in as little as 2 weeks. On the contrary, during the winter months (outdoors) it may require up to 8 or 10 weeks.

As cuttings are made they are dropped into a plastic bucket or pan and then dipped into a solution of Orthocide (1 tablespoon per gallon of water). Cuttings are then taken to our growing benches (tables) and stuck directly into the pots. Our growing/rooting mix is made of 1 part fir bark, 1 part perlite, and 1 part peat moss. Our bark is  $\frac{3}{8}$  to  $\frac{1}{2}$ " screen size.

We found that a finer grind bark, due to the high percentage of very fine material plus the fine particles of peat moss resulted in too much water retention and it gave us problems. The growing mix gives best results if it is on the slightly coarse side to insure adequate drainage and aeration. To this mix of bark, peat, and perlite are added trace elements and other materials to grow a satisfactory plant. We also include about seven pounds of Osmocote per cubic yard.

Pots are placed on our growing tables or in nursery flats and filled with the growing mix above. Cuttings are stuck (one per pot) not over 1" deep, preferably  $\frac{3}{4}$ ", with all leaves left on. Soft tips or flower buds are removed. Cuttings must never be allowed to dry, as soon as flats or a section of the bed is filled, the mist or sprinkler is turned on. These are allowed to run from early morning to evening in hot summer weather with the time cut or modified as needed depending on heat, length of day, wind, etc.

Part of our operation is under mist controlled by time clocks. Most of the area is watered or misted by "L" head sprinklers made by Perma Rain of Lindsay, Calif. These were designed for use in citrus groves but we have found them very satisfactory in



our operation. To get good coverage we place each sprinkler on a pipe riser 12" high (some higher) down the centers of 6 foot wide tables. Sprinklers are spaced about 7 feet apart (some of the earlier installations were further apart but should water pressure be low, or the day windy, coverage is not as good as desired). We modify the plastic tip of each sprinkler by making three small cuts across the inside of the tip to spread or "fog" the water better. Mist heads are on 12" risers, spaced 30" apart with two lines on each 6' table.

After rooting has occurred we top dress the beds or flats with any one of several fertilizers. We may spread dry material (Osmocote) or apply liquid fertilizer as desired. At any time after rooting we may pick up plants and place them in a plastic house where the young plants can be forced into more rapid growth. This is one of the reasons for rooting cuttings all year long.

If we are short of a given kind but have well rooted cuttings they can be moved inside for more rapid growth. We usually feed with two or three applications of liquid fertilizer at half recommended strength at 7 or 8 day intervals. Handled this way, we can finish off young plants in 6 to 8 weeks in the spring, having good plants available for late spring sales which otherwise, if left outdoors, might not be saleable until fall.

To make or keep plants more bushy we shear as needed. If carefully trimmed, the plant is improved and we can get a good quantity of fine cutting material. This is especially useful in propagating sufficient quantities of new cultivars. Sales of miniature rose plants goes on over most of the year and so having plants in varying stages of growth is really better use of facilities as young plants of good quality can be made available as needed.

The time necessary from cutting to saleable plant will vary considerably depending upon such factors as cultivar, size of pot, time of year, whether grown (or finished) in the greenhouse, etc. We do not like to really "force" our plants but prefer a slower sustained time of growing. Even the plants we may move into the greenhouse to finish off in the spring are usually allowed to harden off some before shipping. This is mainly the reason for applying the two or three light applications of liquid fertilizer. It allows the growth to respond quickly as needed and then to slow down as the fertilizer is used up.

To sum up our miniature rose production:

- 1) To assure ease and rapidity of rooting we breed these qualities into our new cultivars. This makes for rapid and economic production.
- 2) We select what we feel are the best cultivars from our own and other breeding.

- 3) We discard or drop cultivars which have been superseded by newer or better kinds.
- 4) Types of cuttings: we make cuttings 2 to 3 nodes long (the general rule) but may also, if material is available and plants are needed quickly, use branched (2 to 3 stem) cuttings. Cuts are made directly below a node.
- 5) Cuttings are never allowed to dry out; they are dipped in a fungicide solution, drained, and stuck as soon as possible.
- 6) All cuttings are dipped in a Hormex rooting powder.
- 7) Cuttings are misted during the daytime until rooted.
- 8) Growing/rooting mix: 1 part peat: 1 part fir bark; 1 part perlite.
- 9) Beds or flats of pots are top dressed with fertilizer as needed.
- 10) Time from cutting to finished plant varies depending upon pot size, time of year, weather, fertilizer, in or out of greenhouse. Normal time (average) is 6 to 10 months.
- 11) Mother plants are grown in 1 or 2 gallon plastic pots.

### MINIATURE TREE ROSE PRODUCTION

To grow our miniature tree roses we start with the understock cultivar which, in our case, is 'Pink Clouds.' It originated with us as a cross of 'Oakington Ruby' (miniature) X *R. multiflora*. It grows very much like *R. multiflora* but the long canes are nearly thornless, dark green in color with excellent leathery foliage. We have tried several other understocks but come back to 'Pink Clouds.'

Cuttings are made about 16 to 17 inches in length, averaging about pencil size. Each cutting is de-eyed, leaving two leaves at the top. We have found that 'Pink Clouds' roots better and quicker if leaves are left on. Cuttings are then scored with a Multi-Rooter tool (cuts four 1" vertical slits (wounds). This hastens rooting and gives a better balanced root system.

Basal ends of the cuttings are then placed in water (1" deep) until they can be planted. Each cutting is dipped in Hormex powder and stuck into a growing mix in 3" square plastic pots. Constant mist has given best results for rooting tree rose understock. We use these pots as more fit into the rooting bed and, when rooted, plants can be transferred to 5" pots to grow on. As soon as good growth is underway these understocks are budded to the desired cultivars of miniature roses

When the buds have "taken" most of the 'Pink Clouds' top is cut back (later completely removed) to force the buds into



growth. As each new shoot becomes 2 to 3" long it is pinched to force out bushy lateral growth. This growth may be pinched several times if desired to develop a bushy top (or head). When the understock is well rooted in the pot and the top is of sufficient size the young tree roses (standards) are ready to sell.

## **ROSE HYBRIDIZATION**

**WILLIAM A. WARRINER**

*Jackson and Perkins*  
*6767 Irvine Blvd*  
*Santa Ana, California 92705*

Rose hybridizing does not really fit into the usual concept of plant propagation; that is, making more plants of the same cultivar than what you start with. This kind of propagation is an important part of hybridization and will be touched on later, but the first requirement is to make or propagate plants quite different from what you start with.

Plant breeding is one of the really important aspects of agriculture having been one of the sciences contributing to the ever increasing production of food and fiber. There are many Ph.D's in universities and industry researching, teaching, and producing new products, plus all their support people. The size of individual crops is tremendous whether measured in acres, dollars, yield or any way you want to measure.

Rose breeding and rose growing are tiny parts of the agricultural industry, although one of the larger parts of the nursery industry. Rose breeding, along with other ornamental breeding departs, also, from a purely scientific nature to a mixture of science and art or aesthetics.

For the most part, rose breeding is supported by private business although a few universities and experiment stations in North America are doing a little and trying to get funded to do more. In Holland, there is government supported work on rose breeding, supposedly to develop an understanding of the genetics of hybrid roses, but Dutch breeders fear it will be government competition. This effort is separate from the Aalsmeer proof-station where new cultivars from all over are tested for performance as producers of cut flowers.

Europe, with a population comparable to that of North America, has, at least, 29 active commercial rose breeders, some small, but three; Kordes, Tantau and Meilland may be the largest in the world.